

WHAT IS CLAIMED IS:

1. A liner for covering a residual limb of an amputee comprising:
a sock-shaped fabric member; and
a stretch limiting element incorporated into an exterior surface of
5 the sock-shaped fabric member at a distal end portion thereof and formed of a
material that has less elasticity than the sock-shaped fabric member such that
the elasticity of the distal end portion is reduced to provide surface
reinforcement and for limiting stresses of distal end elongation.

2. A liner for covering a residual limb of an amputee comprising:
10 a fabric liner body formed of at least two fabric pieces, one of the
fabric pieces being a distal end piece that is attached to at least one other fabric
piece along a circumferential edge of the distal end piece, the distal end piece
being free of a transverse seam extending across the distal end piece; and
a coating formed of a material that is integrally adhered to an
15 exterior surface of a distal end region of an outer surface of the fabric liner body
for providing surface reinforcement thereat and for limiting stresses of distal end
elongation and rotation in a prosthetic socket.

3. The liner of claim 2, wherein the fabric member is formed of
first and second side pieces that are attached to one another along vertical
20 edges thereof, the distal end piece having an annular shape such that the distal
{W:\06870\0200160-us0\00092767.DOC {00000000-0000-0000-0000-000000000000} }

end piece is attached to one end of each of the first and second side pieces to produce a circumferential seam.

4. The liner of claim 3, wherein each of the first and second side pieces has an elongated generally rectangular shape.

5 5. The liner of claim 3, wherein the first and second side pieces are stitched to one another along the vertical edges thereof.

6. The liner of claim 3, wherein the distal end piece is attached to the first and second side pieces by a circumferential stitched seam.

7. The liner of claim 2, wherein the fabric member is formed of
10 at least two polymeric materials.

8. The liner of claim 7, wherein the fabric member is formed of a knit of polyester fibers and polypropylene fibers, the polyester fibers formed a first side of the fabric member and the polypropylene fibers forming a second side of the fabric member.

15 9. The liner of claim 8, wherein the coating is formed on the first side of the fabric member.

5 complete circumference around the distal end of the liner so as to distribute anti-elongation forces in a 360° manner.

5 complete circumference around the distal end of the liner so as to distribute anti-elongation forces in a 360° manner.

13. The liner of claim 2, wherein the material is a material
0 selected from group consisting of: polyurethanes; liquid silicones; polyamides;
rubber latices; and mixtures thereof.

0 selected from group consisting of: polyurethanes; liquid silicones; polyamides;
rubber latices; and mixtures thereof.

15. The liner of claim 2, wherein the material comprises a
5 material that can be applied under ambient conditions.

5 material that can be applied under ambient conditions.

16. The liner of claim 2, wherein the coating is applied over one or more seams formed where the at least two fabric pieces are joined to one another.

17. The liner of claim 2, wherein the fabric liner includes an open end and a closed distal end.

18. The liner of claim 2, further including:

a pin receptacle that is attached to the distal end of the liner body
5 on an exterior thereof.

19. The liner of claim 18, wherein said pin receptacle includes a skirt surround a receptacle body, the coating being applied over the skirt and onto the distal end region of the fabric liner.

20. The liner of claim 19, wherein the coating is disposed 360°
10 around the skirt.

21. The liner of claim 19, wherein the receptacle body is a rigid metal member and includes a threaded bore.

22. The liner of claim 2, wherein the coating has a wave-like pattern.

15 23. The liner of claim 2, wherein the coating comprises a plurality of discrete elongated strips of the flexible material with one end of the strip being adhered to a pin receptacle that is attached to the distal end of the fabric liner on an exterior thereof and an opposite end terminating in the distal end region of the fabric liner.

24. The liner of claim 23, wherein each strip has a generally rectangular shape.

25. The liner of claim 23, wherein each strip has a length between about 1 ½ inch and about 6 inch.

26. The liner of claim 2, wherein the coating comprises a plurality of discrete elongated strips of flexible material with one end of the strip terminating proximate or at an inner circumferential edge of a pin receptacle that is attached to the distal end of the fabric liner and an opposite end terminating along the fabric liner body.

27. The liner of claim 2, further including:
a pin receptacle that is attached to the distal end of the liner body on an exterior thereof, the pin receptacle including a skirt surrounding a receptacle body with the coating being applied on the exterior of the skirt and onto the distal end region of the fabric liner anywhere from a distance between about 1 ½ inch to about 4 inch above an upper peripheral edge of the pin receptacle.

28. A liner for covering a residual limb of an amputee, the liner comprising:

a fabric liner body having formed of at least two fabric pieces, one of the fabric pieces being a distal end piece that is attached to at least one other

fabric piece along a circumferential edge of the distal end piece, the distal end piece being free of a transverse seam extending across the distal end piece;

a pin receptacle that is attached to the distal end of the liner body on an exterior thereof; and

5 a first stretch limiting element that is disposed at least partially on the pin receptacle and extends onto and is adhered to a distal section of the liner body; the stretch limiting element being formed of a coating that has limited flexibility and is integrally adhered to an outer surface of the fabric liner body for providing 360° of surface reinforcement of the fabric liner as well as distributing
10 anti-elongation forces in a 360° manner.


29. The liner of claim 28, further including:

a second stretch limiting element that is disposed at or near a proximal section of the liner body, the stretch limiting element being formed of a coating that has limited flexibility and is integrally adhered to an outer surface of
15 the fabric liner body along at least a partial circumference thereof for providing surface reinforcement of the fabric liner as well as limiting the amount of circumferential stretch of the liner.

30. A liner for covering a residual limb of an amputee comprising:

a fabric liner body formed of at least two fabric pieces, one of the
20 fabric pieces being a distal end piece that is attached to at least one other fabric

piece along a circumferential edge of the distal end piece, the distal end piece

{W:\06870\0200160-us0\00092767.DOC  }

the coating having a hardness between about 10 and about 70 durometer (Shore A).

33. The method of claim 32, further including the step of:

disposing the liner on an outer surface of a rotatable mandrel prior

5 to applying the coating; and

rotating the mandrel as the material is applied to the fabric liner

body.

34. The method of claim 33, wherein the mandrel is rotated at a

speed between about 20 and about 60 RPM.

10 35. The method of claim 32, further including the step of:

masking the fabric liner body to define an exposed area where the

material is to be applied to form the coating.

36. The method of claim 35, wherein the step of masking the

fabric liner body includes the step of placing a mask material 360° around the

15 fabric liner body.

37. The method of claim 35, wherein the step of masking the

fabric liner body includes the step of placing a mask material 360° around the

fabric liner body so that up to a bottommost 6 inches of the fabric liner body is exposed.

38. The method of claim 32, wherein the step of applying the material comprises the step of:

placing the material 360° around the fabric liner body so that the resulting coating extends 360° around the fabric liner body.

5 39. The method of claim 32, wherein the step of applying the material comprises the step of:

applying the material with sufficient pressure to cause the material to seep into the interior of the fabric liner body resulting in the coating being integrally adhered to the fabric liner body.

10 40. The method of claim 39, wherein the step of applying the material comprises the step of:

providing an applicator;

disposing an amount of the material on a selected portion of the fabric liner body;

15 rotating the fabric liner body; and

applying a force with the applicator against the material to cause the material to seep into the interior of the fabric liner body and into any seams of the fabric liner body.

20 41. The method of claim 40, wherein the applicator comprises a squeegee.

42. The method of claim 40, wherein the applicator comprises an at least partially automated device including a handle portion and a body portion that includes a plurality of openings formed therein for discharging the material onto an applicator surface of the body portion, the material being delivered to the plurality of openings through a conduit that is at least partially disposed in the handle portion.

43. The method of claim 42, wherein the applicator body portion comprises a flexible member.

44. The method of claim 40, wherein the applicator comprises an automated device that includes a housing for receiving the fabric liner body therein and a rotatable drive shaft at least partially extending within the housing and configured to be operatively coupled to a pin receptacle associated with the liner for controlled rotation thereof, the housing having a mechanism for discharging the material onto the fabric liner body and a wiper for smoothing the material and for applying force to the material to cause the material to become integrally disposed within the fabric liner body.

45. The method of claim 32, further including the steps of:
smoothing the material so that it has a substantially uniform
thickness;

20 exposing the fabric liner body with the material to conditions to

cause the formation of the coating; and

curing the material to form the coating.

46. The method of claim 32, wherein the step of providing the fabric liner body includes the step of:

5 attaching a pin receptacle on the distal end of the fabric liner body,
the pin receptacle including at least a partially flexible skirt portion.

47. The method of claim 32, wherein the step of applying the material includes the step of:

applying the material circumferentially about the skirt portion and
10 the distal end region of the fabric liner body.

48. The method of claim 32, wherein the step of providing the fabric liner body includes the steps of:

providing at least two fabric pieces, one of the fabric pieces being a distal end piece; and

15 attaching the distal end piece to at least one other fabric piece
along a circumferential edge of the distal end piece, the distal end piece being
free of a transverse seam extending across the distal end piece.

49. The method of claim 32, wherein the fabric liner body is formed of first and second side pieces that are attached to one another along

51. An automated method of providing surface reinforcement at a distal end of a liner for covering a residual limb of an amputee and for limiting stresses associated with distal end elongation of the liner, the method comprising the steps of:

rotating the liner; and

{W:\06870\0200160-us0\00092767.DOC 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 }

against the fabric liner body and a plurality of ports formed therethrough for selectively discharging the material, the applicator having an on-off switch to permit selective discharge of the material.